

CLAIMS**Method**

1. A method for detecting an object (1) in a zone (2) situated in the proximity of an interface (3) between two liquid and/or gaseous media, especially an interface of the water/air type; the said object (1) being illuminated by electromagnetic radiation (4) comprising at least two different wavelengths, especially situated in regions corresponding to the near infrared on the one hand and to blue-green on the other hand; the said media having different absorption coefficients as a function of the wavelengths of the electromagnetic radiation (4); the said method comprising the following stages:

- (a) the stage of choosing, from among the wavelengths of the electromagnetic radiation (4), at least two wavelengths or two wavelength regions,

- (b) the stage of creating, for each of the said wavelengths or wavelength regions, an image (5) of the said interface (3) and of the said zone (2),

- (c) the stage of producing electrical signals (6) representative of each image (5),

- (d) the stage of digitizing the electrical signals (6) in such a way as to produce data (7) corresponding to each image (5),

- (e) the stage of extracting, from the said data (7) corresponding to each image (5), two groups of data (7), wherein the groups are representative of at least part of the said object (1) in the near infrared region and in the blue-green region respectively,

- (f) the stage of comparing the said groups of data (7);

the stages (c) to (f) being referred to hereinafter as the process of deducing the presence of an object (1);

such that it is possible thereby to detect the presence of an object (1) and/or to determine the position of the detected object (1) relative to the said interface (3), while discriminating between an object (1) situated entirely under the interface (3) and an object (1) situated at least partly above the interface (3).

2. A method according to claim 1; the said method additionally comprising:

- the stage of integrating over time the results of the stage of comparison of the said groups of data (7).

3. A method according to claim 2; the said method additionally comprising:

- the stage of tripping an alarm (8) if an object (1) of human size is detected under the said interface (3) for a time longer than a specified threshold.

4. A method according to any one of claims 1 to 3; the said method being such that calottes (9) (within the meaning of the present invention) are generated in order to extract, from the said data (7) corresponding to each image (5), two groups of data (7), wherein the groups are representative of at least part of the said object (1) in the near infrared region and in the blue-green region respectively.

5. A method according to claim 4; the said method additionally comprising the following stages:

- the stage of associating characteristics (10) (within the meaning of the present invention) with each calotte (9),

- the stage of deducing the presence of a group of data (7), wherein the group is representative of at least part of the said object (1) if the characteristics (10) exceed a predetermined threshold SC.

6. A method according to any one of claims 1 to 5; the said method being such that, in order to compare the said groups of data (7), a search is performed for data (7) representative of at least part of the said object (1) in the blue-green region, for which data, within a specified geometric vicinity (11), there are no corresponding data (7) representative of at least part of the said object (1) in the near infrared region;

such that it can be concluded from a positive search that the said object (1) is situated under the interface (3).

7. A method according to any one of claims 1 to 5; the said method being such that, in order to compare the said groups of data (7), a search is performed for data (7) representative of at least part of the said object (1) in the blue-green region, for which data, within a specified geometric vicinity (11), there are corresponding data (7) representative of at least part of the said object (1) in the near infrared region;

such that it can be concluded from a positive search that the said object (1) is situated at least partly above the interface (3).

8. A method according to claim 2 in combination with any one of claims 1 to 7; more particularly intended to discriminate between a stationary object (1) and a moving object (1); to integrate over time the results of the stage of comparison of the said groups of data (7), the said method additionally comprising the following stages:

- the stage of iterating, at specified time intervals, the said process of deducing the presence of the said object (1);

- the stage of calculating the number of times that the said object (1) is detected during a specified time period T1;

- the stage of discriminating, at one point of the said zone (2), between the said objects (1) that are present a number of times greater than a specified threshold S1 (the said objects (1) being referred to hereinafter as stationary objects (1)) and the said objects (1) that are present a number of times smaller than the said specified threshold S1 (the said objects (1) being referred to hereinafter as moving objects (1));

such that it is possible thereby to detect the presence of a stationary object (1) situated entirely under the interface (3) and thus to trip an alarm (8).

#### **System**

9. A system for detecting an object (1) in a zone (2) situated in the proximity of an interface (3) between two liquid media (12) and/or gaseous media (13), especially an interface of the water/air type; the said object (1) being illuminated by electromagnetic

radiation (4) comprising at least two different wavelengths, especially situated in regions corresponding to the near infrared on the one hand and to blue-green on the other hand; the said media having different absorption coefficients as a function of the wavelengths of the electromagnetic radiation (4); the said system comprising:

- (a) selecting means (14) for choosing, from among the wavelengths of the electromagnetic radiation (4), at least two wavelengths or two wavelength regions,

- (b) filming means (15) for creating, for each of the said wavelengths or wavelength regions, an image (5) of the said interface (3) and of the said zone (2),

- (c) converting means (16) for producing electrical signals (6) representative of each image (5),

- (d) digitizing means (17) for digitizing the electrical signals (6) in such a way as to produce data (7) corresponding to each image (5),

- (e) information-processing means (18) for extracting, from the said data (7) corresponding to each image (5), two groups of data (7), wherein the groups are representative of at least part of the said object (1) in the near infrared region and in the blue-green region respectively,

- (f) calculating means (19) for comparing the said groups of data (7);

the converting means (16), the digitizing means (17), the information-processing means (18) and the calculating means (19) being referred to hereinafter as the means for deducing the presence of an object (1);

such that it is possible thereby to detect the presence of an object (1) and/or to determine the position of the detected object (1) relative to the said interface (3), while discriminating between an object (1) situated under the interface (3) and an object (1) situated at least partly above the interface (3).

10. A system according to claim 9; the said system additionally comprising:

- integrating means (20) for integrating over time the results of the means (19) for calculating the said groups of data (7).

11. A system according to claim 10; the said system additionally comprising:

- activating means (21) for activating an alarm (8) if an object (1) of human size is detected under the said interface (3) for a time longer than a specified threshold.

12. A system according to any one of claims 9 to 11; the said system being such that the said information-processing means (18) make it possible to generate calottes (9) (within the meaning of the present invention).

13. A system according to claim 12; the said system being such that the said information-processing means (18) make it possible:

- to associate characteristics (10) (within the meaning of the present invention) with each calotte (9),
- to deduce the presence of a group of data (7), wherein the group is representative of at least part of the said object (1), if the characteristics (10) exceed a predetermined threshold SC.

14. A system according to any one of claims 9 to 13; the said system being such that the said calculating means (19) make it possible to search for data (7) representative of at least part of the said object (1) in the blue-green region, for which data, within a specified geometric vicinity (11), there are no corresponding data (7) representative of at least part of the said object (1) in the near infrared region;

such that it can be concluded from a positive search that the said object (1) is situated under the interface (3).

15. A system according to any one of claims 9 to 13; the said system being such that the said calculating means (19) make it possible to search for data (7) representative of at least part of the said object (1) in the blue-green region, for which data, within a specified geometric vicinity (11), there are corresponding data (7) representative of at least part of the said object (1) in the

near infrared region;

such that it can be concluded from a positive search that the said object (1) is situated at least partly above the interface (3).

16. A system according to claim 10 in combination with any one of claims 9 to 15; more particularly intended to discriminate between a stationary object (1) and a moving object (1); the said integrating means (20) for integrating over time the results of the calculating means (19) making it possible:

- to iterate, at specified time intervals, the use of the said means for deducing the presence of the said object (1);

- to calculate the number of times that the said object (1) is detected during a specified time period T1;

- to discriminate, at one point of the said zone (2), between the said objects (1) that are present a number of times greater than a specified threshold S1 (the said objects (1) being referred to hereinafter as stationary objects (1)) and the said objects (1) that are present a number of times smaller than the said specified threshold S1 (the said objects (1) being referred to hereinafter as moving objects (1));

such that it is possible thereby to detect the presence of a stationary object (1) situated entirely under the interface (3);

such that it is possible thereby to trip an alarm (8).